09/674101
414 Rec'd PCT/PTO 26 OCT 2000

UNITED STATES PATENT APPLICATION TRANSMITTAL FORM

BOX PCT
ASSISTANT COMMISSIONER FOR PATENTS
Washington, D.C. 20231
Attention: DO/EO/US

Docket No.: 875.0005USU

Sir:

Transmitted herewith for filing is the patent application of

Applicant (s):	Mikko Kanerva; Pekka Hämäläinen; Seppo Huotari and Erkki Yli-Juuti
For:	HANDLING OF FORWARDED CALLS
International Application No.:	PCT/FI99/00345
International Filing Date:	28 April 2000

ENTERING OF U.S. NATIONAL STAGE UNDER 35 U.S.C. §371

Transmitted herewith for filing are the following documents submitted under 37 C.F.R. §1.495(b) for the purpose of entering the national stage in the United States of America as an elected office. Enclosed are:

XXXX Specification and Claims with Declaration;

_____ Specification and Claims *without* Declaration;

XXXX 6 sheets of drawings;

XXXX Preliminary Amendment;

XXXX An Assignment of the invention to: **Nokia Networks Oy**, including $40.00 recordation fee;

_____ The certified copy of a priority application;

XXXX Information Disclosure Statement with copies of patent(s) (Form - PTO-1449);

_____ Verified Statement of Small Entity (Independent Inventor);

_____ Verified Statement of Small Entity (Small Business Concern);

XXXX Priority of application Serial No. 980991, filed on 05 May 1998 in Finland; and PCT International Application No. PCT/FI99/00345 filed on 28 April 1999 is claimed under 35 U.S.C. §119 and 35 U.S.C. §365;

XXXX Cover page of published PCT Publication No. WO 99/57916;

XXXX Copy of International Preliminary Examination dated 13 July 2000;

_____ Copy of PCT Demand Under Article 31; and

XXXX Copy of International Search Report dated 21 October 1999.

_____ Copy of Written Opinion.

_____ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) are transmitted herewith.

The Filing Fee is calculated below.

CLAIMS AS FILED				
(1) For	(2) Number Filed	(3) Number Extra	(4) Rate	(5) Basic Fee $670/$760//**$840/** $970/$96
Total Claims	17 - 20 =	0	x $18.00	**$0**
Independent Claims	4 - 3 =	1	x $80.00	**$80.00**
Multiple Dependent Claim Fee				x $260.00 = $0.00
TOTAL FILING FEE				**$920.00**
1/2 FILING FEE FOR SMALL ENTITY				**$0**

XXXX Firm's check in the amount of $ **960.00** to cover the filing fee ($840) and Assignment recordal fee ($40);

XXXX The Commissioner is hereby authorized to charge any additional fees under 37 C.F.R. 1.16 and 1.17 which may be required with this communication or during the entire pendency of the application, or credit any overpayment, to **Deposit Account No. 01-0467.** A duplicate copy of this Form is enclosed.

XXXX Postcard.

Address all future communications to: **Harry F. Smith, Esq.**
Ohlandt , Greeley, Ruggiero & Perle, L.L.P.
One Landmark Square, 10th Floor
Stamford, Connecticut 06901-2682
U.S.A.

October 26, 2000
Date of Signature

Harry F. Smith, Esq.
Attorney for Applicant(s)
Ohlandt, Greeley, Ruggiero & Perle, L.L.P.
Registration No. 32,493
Telephone: (203) 327-4500
Telefax: (203) 327-6401

CERTIFICATE OF EXPRESS MAILING

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" Certificate No. **EL562863185US,** service under 37 CFR §1.10 and is addressed to: Box PCT, Assistant Commissioner for Patents, Washington, D.C. 20231, Attention: DO/EO/US on October 26, 2000.

Joanne A. Romaniello
(Typed name of person mailing paper)

(Signature of person mailing paper)

09/674101
875.0005USU
532 Rec'd PCT/PTC 26 OCT 2000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Mikko Kanerva et al.
Serial No.:	Not Yet Assigned
For:	HANDLING OF FORWARDED CALLS
Filed:	Concurrently Herewith
Examiner:	Not Yet Assigned
Art Unit:	Not Yet Assigned

Assistant Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

This Preliminary Amendment is herewith filed in conjunction with the filing of a National Stage U.S. Patent Application which claims priority from PCT/FI99/00345 filed April 28, 1999 and Finnish Application 980991 filed May 5, 1998. A PCT Article 34 Amendment which amends the specification and claims is also filed herewith. Applicants submit that this Preliminary Amendment amends the claims of the PCT Article 34 Amendment. The following amended claims do not go beyond the disclosure in the PCT/FI99/00345.

In the Claims

Please amend the claims shown in the PCT Article 34 amendment as follows.

1. (Amended) A method of handling calls in a telecommunication system comprising subscribers and network elements such as exchanges, comprising the steps of:

storing in the system subscriber information including [information including] service definitions of a subscriber;

establishing connections to the subscriber via a network element having access to the subscriber information of the subscriber;

allowing a subscriber to define in his subscriber information that his incoming calls are to be forwarded to another subscriber; and

indicating the forwarding of a call and optionally a caller's identity in [the] a call establishment signaling;

characterized in that the method further comprises the steps of:

storing a group of caller identities in the subscriber information for defining a group of allowed caller identities, said allowed caller identities being either those included in or excluded from the group,

determining whether the caller identity of an incoming forwarded call belongs to the allowed identities by comparing the caller identity with said group of caller identities, in response to receiving the call establishment signaling in the network element,

continuing to establish [establishing] the incoming forwarded call if the caller identity belongs to the allowed identities, and

rejecting the incoming forwarded call if the caller identity does not belong to the allowed identities.

2. (Amended) A method according to claim 1 in which the subscriber defines [himself] the group of caller identities.

3. (Amended) A method according to claim 1 [or 2] in a system, using [in which] a call forwarding counter [is used] in the call establishment signaling, in response to receiving call establishment signaling requesting establishment of a call from a calling subscriber to a first subscriber and determining that the first subscriber has forwarded [his] said first subscriber's calls to a second subscriber, the call is forwarded to the second subscriber, and the value of the call forwarding counter is incremented,

[characterized in that to determine] determining whether the call has been forwarded, the value of the call forwarding counter indicated in the call establishment signaling is compared to predefined value, and if the value of the call forwarding counter exceeds the predefined value, the call is determined to be a forwarded one.

4. (Amended) A method according to [any of the preceding claims] claim 1, characterized in that [the] callers, whose calls are to be rejected, are defined by the group of caller identities.

5. (Amended) A method according to [any of the claims 1 to 4] claim 1, characterized by defining [by] the group of caller identities by [the] callers whose calls are to be accepted, and

rejecting [the] calls whose caller identity does not belong to said group.

6. (Amended) A method according to [any of the preceding claims] claim 1, characterized by accepting calls from an unknown caller number.

7. (Amended) A method according to [any of the preceding claims] claim 1 in a system further comprising [further] an intelligent network capable of storing subscriber information, characterized in that in the network element, the event of receiving a forwarded incoming call to a subscriber having determined [his] said subscriber's forwarded incoming calls to be rejected is defined to be a trigger for sending a query to the intelligent network, and in response to having received the request to establish a call to a subscriber and having determined that the call has been forwarded and the subscriber has determined [his] said forwarded incoming calls to be rejected, a query having the calling [party] party's number as a parameter is sent to the intelligent network, and

in the intelligent network, [the] a set of allowed calling numbers in the subscriber information is stored and in response to having received [the] said query sent by the network element, the set of allowed calling numbers is retrieved from the subscriber information, the calling party number is compared to the set, and the network element is instructed to continue [the] a call establishment procedure if the calling party number belongs to the set of allowed calling numbers and to reject the incoming call if the calling number does not belong to the set.

8. (Amended) A method according to [any of the preceding claims] claim 1 in a fixed network comprising a local exchange the subscriber is connected to, characterized in that the network element is a local exchange and the subscriber information is stored in a database the local exchange is connected to.

9. (Amended) A method according to [any of the claims 1 to 8] claim 1, wherein the method is executed in a mobile telecommunication system comprising

a mobile services switching center (MSC) serving the subscriber, and a visitor location register (VLR) connected to the mobile services switching center (MSC),

characterized in that the subscriber information is stored in the visitor location register (VLR) and the network element is the mobile services switching center (MSC).

10. (Amended) A method according to [any of the claims 1 to 8] claim 1, wherein the method is executed in a mobile telecommunication system comprising:

a home location register (HLR(C); HLR-C; MHLR) storing the subscriber information of a subscriber, and

a gateway mobile services switching center (GMSC-C) via which [the] an incoming calls of the subscriber are routed,

characterized in that the subscriber information is stored in the home location register (HLR) and the network element is the gateway mobile services switching center (GMSC-C).

11. (Amended) A method according to [any of the claims 1 to 8] claim 1, characterized in that to determine whether a [the] call has been forwarded, the presence of [the] a forwarding number indicating the identity of the party having forwarded is studied, and if the forwarding number is present, the call is determined to be [a] forwarded [one].

12. (Amended) A telecommunication system comprising:

exchanges[,] ;

subscribers[,] ;

means (75,77) for storing subscriber information including information about the service definitions of subscriber[,] ;

means (LE(A), LE(B), LE(C)) for establishing calls to a subscriber via an exchange (GMSC-C) having access to the subscriber information of the subscriber[,] ;

means (73) for allowing a subscriber to define in his subscriber information that his incoming calls are to be forwarded to another subscriber[,] ; and

means for indicating (14) in the call establishment signaling the forwarding of a call, and optionally a caller identity, characterized in that the system further comprises:

storing means (75,77) for storing a group of caller identities in the subscriber information for defining a group of allowed caller identities, said allowed caller identities being either those included in or excluded from the group[,] ;

determining means (76) for determining whether the caller identity of an incoming forwarded call belongs to the allowed identities by comparing the caller identity with said group of caller identities, in response to receiving the call establishment signaling in the network element[,] ;

continuing means (78) for continuing establishing the incoming forwarded call if the caller identity belongs to the allowed identities[,] ; and

rejecting means (79) for rejecting the incoming forwarded call if the caller identity does not belong to the allowed identities.

13. (Amended) A telecommunication system according to claim [13] 12, characterized in that the determining means (76) is arranged to verify the forwarding of a call using a call forwarding counter.

14. (Amended) A telecommunication system according to claim 13 [or 14], characterized in that the system further has a configuration means (73) for configuring the subscriber information stored in the storing means (75,77).

15. (Amended) A network element for a telecommunication system having:

exchanges[,] ;

subscribers[,] ;

means (75,77) for storing subscriber information including information about the service definitions of a subscriber[,] ;

means (LE(A), LE(B), LE(C)) for establishing calls to a subscriber via an exchange (GMSC-C) having access to the subscriber information of the subscriber[,] ;

means (73) for allowing a subscriber to define in his subscriber information that his incoming calls are to be forwarded to another subscriber[,] ; and

means for indicating (14) in the call establishment signaling the forwarding of a call, and optionally a caller identity, characterized in the that the network element comprises:

storing means (75,77) for storing a group of caller identities in the subscriber information for defining a group of allowed caller identities, said allowed caller identities being either those included in or excluded from the group[,] ;

determining means (76) for determining whether the caller identity of an incoming forwarded call belongs to the allowed identities by comparing the caller identity with said group of caller identities, in response to receiving the call establishment signaling in the network element[,] ;

continuing means (78) for continuing establishing the incoming forwarded call if the caller identity belongs to the allowed identities[,] ; and

rejecting means (79) for rejecting the incoming forwarded call if the caller identity does not belong to the allowed identities.

16. (Amended) A network element according to claim [16] 15, characterized in that a call forwarding counter is used for verifying the forwarding of call.

17. (Amended) A home location register for a mobile telecommunication system comprising:

exchanges[,] ;

subscribers[,] ;

means (75,77) for storing subscriber information including information about the service definitions of a subscriber[,] ;

means (LE(A), LE(B), LE(C)) for establishing calls to a subscriber via an exchange (GMSC-C) having access to the subscriber information of the subscriber[,] ;

means (73) for allowing a subscriber to define in his subscriber information that his incoming calls are to be forwarded to another subscriber[,] ; and

means for indicating (14) in the call establishment signaling the forwarding of a call, and optionally a caller identity, characterized in that the home location register comprises:

storing means (75,77) for storing a group of caller identities in the subscriber information for defining a group of allowed caller identities, said allowed caller identities being either those included in or excluded from the group[,] ;

determining means (76) for determining whether the caller identity of an incoming forwarded call belongs to the allowed identities by comparing the caller identity with said group of caller identities, in response to receiving the call establishment signaling in the network element[,] ;

continuing means (78) for continuing establishing the incoming forwarded call if the caller identity belongs to the allowed identities[,] ; and

rejecting means (79) for rejecting the incoming forwarded call if the caller identity does not belong to the allowed identities.

REMARKS

The foregoing amendment removes the multiple dependencies from the Article 34 Amendment. Also, the foregoing amendment provides antecedent basis for each element introduced. Further, the foregoing amendment renumbers the claims sequentially. A favorable consideration that results in the early allowance of pending claims 1-17 is earnestly solicited.

Respectfully submitted,

Dated: October 26, 2000

Harry F. Smith
Reg. No. 32,493
Attorney for Applicants
Ohlandt, Greeley, Ruggiero & Perle, L.L.P.
One Landmark Square
Stamford, CT 06901-2682
(203) 327-4500

Handling of forwarded calls

Field of the invention

This invention concerns the handling of forwarded calls.

Background of the invention

Call forwarding is one of the most commonly used services in modern telecommunication networks. A subscriber can specify that calls destined to him are to be forwarded to another subscriber's number. For example, Beth can transfer her calls to Cindy when leaving her home to visit Cindy. A subscriber can specify that his calls be forwarded in various situations. For example, when the CFU (Call Forwarding Unconditional) service is activated, all the calls destined to the subscriber are forwarded to a given number. In the CFB (Call Forwarding on Busy) service, calls are forwarded if the called subscriber is busy. By activating the CFNRy (Call Forwarding on No Reply) service, the subscriber instructs that his calls are to be forwarded after 4 alert tones, for example, if the call is not answered before that. For mobile subscribers the CFNRc (Call Forwarding on Not Reachable) service can be defined. In CFNRc the calls are forwarded if the subscriber is not in the coverage area of the mobile telecommunication network, or if he has turned off his mobile station.

The routing of forwarded calls, as well as the charging principle for forwarded calls, are shown in Figure 1. In the figure, the calling party A makes a call to B. B has forwarded his calls to C. This is done by giving the exchange of B instructions to forward the calls addressed to B to a third party C. Both B and C are fixed network subscribers. A may be a fixed network subscriber or a mobile network subscriber. The call is first routed from A via his Local Exchange LE(A) to the local exchange LE(B) of B. Information concerning the specified call forwarding is stored in LE(B). In response to having received the request for call establishment from LE(A), LE(B) notices that the call is to be forwarded to C. In response to that, LE(B) routes the call to the forwarded to party C via the local exchange LE(C) of C. LE(B) becomes the transit point of the call. The first call leg from A to LE(B) is paid by subscriber A. The forwarded leg from LE(B) to C is paid by subscriber B.

In Figure 2 is shown a situation where the call is forwarded to mobile subscriber. In this example, both A and B subscribers are fixed network subscribers. However, they can also be mobile subscribers without causing any

AMENDED SHEET

remarkable changes in the process. When compared to the case shown in Figure 1, the only difference is the leg between LE(B) and subscriber C. This is due to the basic feature of mobile telecommunication systems: the location of the subscriber is not fixed. Therefore, the location of the subscriber has to be ascertained before establishing the connection.

In modern mobile telecommunications networks, the network maintains information about the location of the mobile subscribers. In the GSM network used as an example in this application, this information is distributed between the home location register HLR and visitor location registers VLR directly connected to mobile services switching centers MSC. The HLR is in the home network of the mobile subscriber and contains the permanent subscriber information and the location information of the mobile subscriber with an accuracy of one VLR area. The VLR area typically equals the area served by one mobile services switching center. The VLR of the visited mobile services switching center VMSC responsible for the area the subscriber is currently visiting contains more exact information about the subscriber's location.

On the leg from LE(B) to subscriber C, the call is first routed to the gateway mobile services switching center GMSC(C) of subscriber C. GMSC(C) is basically any MSC capable of making interrogations to the home location register HLR(C) of subscriber C. In response to having received the HLR inquiry, i.e. the query for routing information, the HLR ascertains the VLR the subscriber is currently visiting, and sends a request PRN (Provide Roaming Number) for a roaming number to that VLR, i.e. VLR(C).

In response VLR(C) returns HLR(C) a roaming number MSRN (Mobile Subscriber Roaming Number) identifying the called subscriber in this VLR. HLR(C) forwards the roaming number to GMSC(C). GMSC(C) adds to the call record comprising information of the call information that subscriber C is receiving the call in the area of VLR(C). Using the received identification MSRN and the message IAM(MSRN) (IAM= Initial Address Message), GMSC(C) establishes a connection to the MSC VMSC(C) currently visited by subscriber C. To identify the called subscriber corresponding to the received roaming number with his identity number IMSI or TMSI (Temporary Mobile Subscriber Identity) VMSC(C) makes a query to VLR(C), which then returns this information. According to the specifications, this is done using messages SIFIC (Send Info For Incoming Call) and CC (Complete Call). Having ascer-

AMENDED SHEET

tained the identity of the called subscriber, VMSC(C) now establishes the final leg of the call to the called subscriber.

In GSM, the basic principle in charging is that the calling subscriber pays the leg between himself and the home network HPLMN(B) (HPLMN= Home Public Land Mobile Network) of the called subscriber. The rest of the route is paid by the called subscriber. The idea here is that the calling subscriber should not have to pay a surprisingly high price for his call, for example, when the called subscriber is roaming in a distant country. According to this principle, when subscriber A in Finland calls a mobile subscriber B whose home network is in New Zealand but who is currently roaming in Finland, the call is routed via New Zealand. Subscriber A pays the leg from Finland to New Zealand and subscriber B the leg from New Zealand back to Finland.

Due to this charging principle, the forwarding subscriber B pays for the leg between LE(B) and the home network of C and subscriber C from his home network onwards. It should be noted that for most operators, reception of calls is free in the home network HPLMN (Home Public Land Mobile Network) of the subscriber. However, when the subscriber is roaming outside his home network, he is charged for the roaming leg from his own home network to the VPLMN (Visited Public Land Mobile Network) he is currently visiting.

The call transfers may be annoying to the subscriber to whom the calls have been transferred especially if he is roaming abroad. An example of such an annoying situation is a malicious call forwarding. In addition to malicious call forwarding, calls may be transferred to a wrong number because of a type mismatch when entering the call transfer command to transfer all the incoming calls of the exchange of a company, for example. The subscriber to whom the calls are forwarded to may, of course, define all his incoming calls to be barred. However, the use of barring of incoming calls prevents him from receiving the calls directed to him directly, i.e. without the malicious or accidental forwarding defined by the forwarding party.

WO98/05153 teaches a method for barring calls forwarded from a certain number. The barring allows a user to selectively to prevent calls from incoming, if they are forwarded from a certain pre-defined number. This provides a solution to a problem of selectively barring calls forwarded by a certain forwarding number.

AMENDED SHEET

The objective of this invention is to solve the above-mentioned problem of the prior art. This objective is achieved using the method and apparatus specified in the independent claims.

Summary of the invention

According to a first aspect of the invention, a method is provided for handling calls in a telecommunication system comprising subscribers and network elements such as exchanges, comprising the steps of:

storing in the system subscriber information including information including service definitions of a subscriber;

establishing connections to the subscriber via a network element having access to the subscriber information of the subscriber;

allowing a subscriber to define in his subscriber information that his incoming calls are to be forwarded to another subscriber; and

indicating the forwarding of a call and optionally caller's identity in the call establishment signaling;

characterized in that the method further comprises the steps of:

storing a group of caller identities in the subscriber information for defining a group of allowed caller identities, said allowed caller identities being either those included in or excluded from the group,

determining whether the caller identity of an incoming forwarded call belongs to the allowed identities by comparing the caller identity with said group of caller identities, in response to receiving the call establishment signaling in the network element,

continuing establishing the incoming forwarded call if the caller identity belongs to the allowed identities, and

rejecting the incoming forwarded call if the caller identity does not belong to the allowed identities.

In a preferred embodiment the subscriber may define in his subscriber information a set of allowed calling party numbers from which also the forwarded calls are to be accepted. In response to having determined that the call has been forwarded, the calling party number indicated in the call establishment request is compared to the set of allowed numbers. If the calling party number does not belong to the set of allowed numbers the call is rejected. If the calling party number belongs to the set of allowed numbers the call establishment procedure is continued. Likewise, the negation of this

AMENDED SHEET

set, i.e. the set of calling party numbers from which the forwarded incoming calls are not to be connected may be specified.

In another preferred embodiment, the set of disallowed forwarding numbers are defined, and the calls having been forwarded by a member of this set are rejected. Again, the negation of this set, i.e. the set of allowed forwarding numbers may be specified. In one implementation of the preferred embodiment, the intelligent network IN is utilized. In this implementation, the set of allowed numbers is stored in the intelligent network. In the exchange of the subscriber, the event of receiving a forwarded call is determined as an IN trigger. In response to having received a request to establish a call, the value of the call forwarding counter is checked to determine whether the call has been forwarded. If the call has been forwarded a query having the calling party number as its parameter is sent to the intelligent network. In the intelligent network, the set of allowed numbers is retrieved from the subscriber information of the called subscriber and the calling party number compared to the set. If the calling party number belongs to the set of allowed numbers the intelligent network instructs the exchange to continue the call establishment procedure. If the calling party number does not belong to the set of allowed numbers the intelligent network instructs the exchange to reject the call and to stop the call establishment procedure. An error message may be returned when rejecting the call. Alternatively, the exchange may be instructed to issue an announcement or to forward the call elsewhere, for example. The call may be forwarded to a network element capable of finding out the identity of the forwarding party, for example.

According to a second aspect of the invention, a telecommunication system is provided, comprising:

exchanges,

subscribers,

means for storing subscriber information including information about the service definitions of a subscriber,

means for establishing calls to a subscriber via an exchange having access to the subscriber information of the subscriber,

means for allowing a subscriber to define in his subscriber information that his incoming calls are to be forwarded to another subscriber, and

means for indicating in the call establishment signaling the forwarding of a call, and optionally a caller identity, characterized in that the system further comprises:

AMENDED SHEET

storing means for storing a group of caller identities in the subscriber information for defining a group of allowed caller identities, said allowed caller identities being either those included in or excluded from the group,

determining means for determining whether the caller identity of an incoming forwarded call belongs to the allowed identities by comparing the caller identity with said group of caller identities, in response to receiving the call establishment signaling in the network element,

continuing means for continuing establishing the incoming forwarded call if the caller identity belongs to the allowed identities, and

rejecting means for rejecting the incoming forwarded call if the caller identity does not belong to the allowed identities.

According to a third aspect of the invention, a network element for a telecommunication system is provided, having:

exchanges,

subscribers,

means for storing subscriber information including information about the service definitions of a subscriber,

means for establishing calls to a subscriber via an exchange having access to the subscriber information of the subscriber,

means for allowing a subscriber to define in his subscriber information that his incoming calls are to be forwarded to another subscriber, and

means for indicating in the call establishment signaling the forwarding of a call, and optionally a caller identity, characterized in that the network element comprises:

storing means for storing a group of caller identities in the subscriber information for defining a group of allowed caller identities, said allowed caller identities being either those included in or excluded from the group,

determining means for determining whether the caller identity of an incoming forwarded call belongs to the allowed identities by comparing the caller identity with said group of caller identities, in response to receiving the call establishment signaling in the network element,

continuing means for continuing establishing the incoming forwarded call if the caller identity belongs to the allowed identities, and

rejecting means for rejecting the incoming forwarded call if the caller identity does not belong to the allowed identities.

According to a fourth aspect of the invention, a home location register for a mobile telecommunication system is provided, comprising:

AMENDED SHEET

exchanges,

subscribers,

means for storing subscriber information including information about the service definitions of a subscriber,

means for establishing calls to a subscriber via an exchange having access to the subscriber information of the subscriber,

means for allowing a subscriber to define in his subscriber information that his incoming calls are to be forwarded to another subscriber, and

means for indicating in the call establishment signaling the forwarding of a call, and optionally a caller identity, characterized in that the home location register comprises:

storing means for storing a group of caller identities in the subscriber information for defining a group of allowed caller identities, said allowed caller identities being either those included in or excluded from the group,

determining means for determining whether the caller identity of an incoming forwarded call belongs to the allowed identities by comparing the caller identity with said group of caller identities, in response to receiving the call establishment signaling in the network element,

continuing means for continuing establishing the incoming forwarded call if the caller identity belongs to the allowed identities, and

rejecting means for rejecting the incoming forwarded call if the caller identity does not belong to the allowed identities.

Brief description of the drawings

The invention is described more closely with reference to the accompanying schematic drawings, in which

Figure 1 shows a forwarded call;
Figure 2 show a call forwarded to a mobile subscriber;
Figure 3 shows a decision algorithm;
Figure 4 shows a decision algorithm according to a preferred embodiment of the invention;
Figure 5 shows a possible division of the tasks according to the invention between different network elements;
Figure 6 shows the structure of a message;
Figure 7 shows functional entities of a telecommunication system; and
Figure 8 shows a system for configuring subscriber information.

AMENDED SHEET

Detailed description of the invention

Some technical solutions for implementing the invention are illustrated below. The exemplary solutions assume that the ISUP (ISDN User Part) signaling protocol is used. However, the chosen signaling protocol has an effect only on the messages used, and the invention can just as well be implemented using some other signaling protocol.

When using ISUP, the following signaling information concerning forwarded calls can be used:

- **redirection number**: Information sent in the backward direction indicating the number to which the call must be rerouted or has been forwarded.
- **call forwarding counter**: Information sent in either direction indicating the number of redirections which have occurred on a call.
- **calling party number**: the number of the calling party.

In addition, the specifications define also other information elements relating to call forwarding information. Examples of these elements are:

- **forwarding number**: Information sent in the forward direction when a call is diverted, indicating the B subscriber number from which the call was forwarded.
- **redirecting reason**: Information sent in either direction indicating, in the case of calls undergoing multiple redirections, the reason why the call has been redirected. These reasons include CFU, CFB, CFNRy and CFNRc.
- **redirecting indicator**: Information sent in either direction, i.e. from the exchange of the forwarding subscriber (the forward direction) or vice versa (the backward direction) indicating whether the call has been diverted or rerouted and whether or not presentation of redirection information to the calling party is restricted.
- **forwarding indicator**: Information sent in the backward direction to indicate whether the call has undergone diversion or rerouting. It also contains information about presentation restrictions.
- **redirection information**: Information sent in either direction giving information about call redirection or call rerouting.
- **redirection number restriction indicator**: Information sent in the backward direction indicating whether the forwarded-to user allows the presentation of his number.

The signaling information is presented more thoroughly in ITU-T (ITU= International Telecommunication Union, ITU-T= the ITU Telecommu-

AMENDED SHEET

nication standardization sector) recommendations Q.762 and Q.763 published by ITU.

A plurality of the above pieces of signaling information may be used to determine if the call has been forwarded. The call may be determined having been forwarded if the forwarding number is present in the call establishment signaling, for example. However, it has been observed that the operators usually do not use all the information fields presented above, but on the forwarded leg, only the calling number, forwarded-to number and the call forwarding counter are used in the call establishment signaling. It is therefore advantageous to use the call forwarding counter when determining whether the call has been forwarded or not.

A decision flowchart for determining whether the call is forwarded or not and whether it is to be rejected or not is presented in Figure 3. This algorithm may be running in the local exchange of a fixed network subscriber or in the mobile services switching center currently serving a mobile subscriber, for example. In this context, the word exchange is used to mean either a local exchange, a mobile services switching center or any similar network element participating the call establishment procedure and having access to the subscriber information of the subscriber the call is being routed to.

At stage I2 the exchange receives a request for establishing a call to subscriber C. In the request, at least the identity number such as the mobile station ISDN number of subscriber C and the value of the call forwarding counter CFC are given.

Having received the request, the procedure enters stage I2, in which the subscriber information of subscriber C is checked. This is done on the basis of a database query made in stage I10. The database may be, for example, an internal database of the local exchange, the Visitor Location Register VLR the mobile services switching center is connected to, or a database in the intelligent network. The query returns, among other things, the Forwarded Call Barring BFC flag.

The procedure now enters stage I3, in which the presence of the BFC flag is studied. If the flag is not present, i.e. flag=0, for example, the procedure goes to stage I20 in which the call establishment procedure is continued.

If the BFC flag is found to be present in stage I3, the procedure enters stage I4, in which the value of the call forwarding counter CFC is compared to the given threshold value 0. A value higher than this threshold is

AMENDED SHEET

defined to be an indication of the call having been forwarded. If the comparison shows that the call has not been forwarded, i.e. CFC=0, the procedure enters stage I20, in which the call establishment procedure is continued.

If the comparison at stage I4 shows that the call has been forwarded, the YES branch is chosen, and the procedure enters stage I5 in which the call is rejected and the call establishment procedure interrupted. According to one preferred embodiment of the invention, the calling party is given an announcement telling the reason for the rejection of the call.

According to another preferred embodiment, the call is forwarded to a predefined destination. Preferably the call is forwarded to destination capable of determining the identity of the forwarding party. Different destinations for different situations, e.g. for

- calls from different calling subscribers,
- calls forwarded by different subscribers and
- calls forwarded for different reasons (i.e. CFU, CFNRc, etc.)

may preferably be defined.

In a preferred embodiment the subscriber may define in his subscriber information a set of allowed numbers from which the calls are to be accepted even if the call has been forwarded. In his exchange, in response to having determined the call has been forwarded, the calling number indicated in the request for establishing a call is compared to the to the set of allowed numbers. If the indicated number does not belong to the set of allowed numbers the call is rejected. If the indicated number belongs to the set of allowed numbers, the call establishment procedure is continued. A special situation occurs when the calling party number is not indicated in the call establishment signaling. According to one embodiment, the subscriber may define such calls from unknown origination to be rejected or to be accepted. A flowchart showing the algorithm for decision making in this preferred embodiment of the invention is presented in Figure 4.

At stage J2 the exchange receives a request for establishing a call to subscriber C. In the request, at least the identity number such as the mobile station ISDN numbers of subscriber C and the calling party, i.e. subscriber A (MSISDNA) and the value of the call forwarding counter CFC are given.

The procedure then enters stage J2, in which the subscriber information of subscriber C is checked. This is done using the database query in stage J10. The query returns, among other things, the Forwarded Call Barring BFC flag and the set {ALLOWED NUMBERS} of allowed numbers.

AMENDED SHEET

The procedure now enters stages J3 and J4, in which the presence of the BFC flag and the value of the call forwarding counter CFC are studied. If the BFC flag is not present or the value of the call forwarding counter shows that the call has not been forwarded, the procedure goes to stage J20 in which the call establishment procedure is continued.

If both the BFC flag is present and the verification of the CFC shows that the call has been forwarded the procedure enters to stage J5, in which the calling party identity number MSISDN(A) is compared to the set {ALLOWED NUMBERS}. If MSISDN(A) belongs to the set, the procedure enters stage J20, in which the call establishment procedure is continued. If MSISDN(A) does not belong to the set the procedure enters to stage J in which the call is rejected and the call establishment procedure interrupted. According to a preferred embodiment of the invention, the calling party is given an announcement telling the reason of the rejection of the call. Again, the call may alternatively be forwarded to a predefined destination. It is, however, not essential to the above embodiment that both the BFC flag and the set of allowed numbers are stored in the same database. In that case it is adequate to query the database including the set of allowed numbers before stage J5.

The above presented embodiment is especially advantageous in telecommunication systems where some services are implemented using call forwarding. An example of such a service is the home call service, in which calls between two subscribers, subscribers A and B, are given a cheaper price. The service is used by dialing a given number, e.g. 020100, which is then mapped to the right subscriber number by the intelligent network, and the call is then established to this subscriber number. The call is seen to be a forwarded one. If all the forwarded calls would be barred also the home calls would be barred. However, for all the received calls according to the home call service the calling party number is the same. Using the above presented embodiment the home calls can then be accepted even when using the forwarded call barring service.

In another embodiment, the BFC flag is not a binary piece of information but has more possible values specifying the situation in which the forwarded calls are to be rejected. For example, the flag could comprise values for following situations:

- CFU,
- Call from an unknown number,

AMENDED SHEET

- CFNRc,
- CFNRy, and
- IN-based forwarding.

Thus, the subscriber is able to define only one or selected set of his forwarded incoming calls to be rejected, based on the redirection reason, for example. This embodiment can be used in networks in which the inter exchange signaling supports exchange of such information.

One preferred implementation of the above presented embodiment is shown in Figure 5. According to the implementation, the functionality is distributed between the exchange and the intelligent network. The network elements of the intelligent network shown in the figure, are the service control point SCP and the service database SDB. In the exchange MSC, a service switching point SSP is implemented. According to the basic functionality of an intelligent network, the SSP follows the states of the calls. In the SSP some trigger conditions are defined. When a trigger condition is met, a message is sent to the SCP. The SCP receives the message, and controls the call based on the message and predefined configurations. The configurations are stored in the service database SDB.

In the exchange, the event of receiving an forwarded call is determined as a trigger. When receiving a request to establish a call to a subscriber, and determining that the calls has been forwarded and the subscriber has defined his forwarded incoming calls to be barred a query is sent to the intelligent network. The calling party number is included as a parameter in the query.

The set of allowed numbers for the subscriber is stored in the subscriber information of the subscriber stored in the intelligent network. In response to having received the query sent by the exchange, the set of allowed numbers is retrieved from the subscriber information of the called subscriber. If the calling party number belongs to the set of allowed numbers the intelligent network instructs the exchange to continue the call establishment procedure. If the calling number does not belong to the set the intelligent network instructs the exchange to reject the call.

In mobile telecommunication systems, the subscriber information is stored in the home location register HLR or in the intelligent network. The information stored in the HLR is copied to the visitor location register VLR connected to the mobile services switching center MSC currently serving the subscriber. The functionality of the invention may be distributed between the

AMENDED SHEET

MSC and the VLR. In this embodiment, the subscriber data is stored in the VLR and the decision algorithm is running in the MSC.

The preferred embodiment can be implemented by storing also the set of allowed calling party numbers in the VLR and to run the decision algorithm in the MSC. Alternatively, the decision algorithm may be distributed between the MSC and the intelligent network IN. Then, the VLR only contains the value of the BFC flag. In response to detecting that the call has been forwarded and that the BFC flag is present in the subscriber info of the subscriber the call is being routed to, an IN query is triggered. The IN has the set of allowed numbers. Based on the calling party number indicated in the query, the IN determines whether the call is to be established or rejected, and instructs the MSC to do so.

According to one embodiment used for mobile telecommunication systems, the decision algorithm is running in the gateway mobile services switching center GMSC capable of making interrogations to the home location register of the subscriber. In this embodiment, the GMSC receives the request for establishing a call to subscriber C. In response to having received this request the GMSC sends a request SRI (Send Routing Information) for routing information to the home location register HLR(C) holding the subscriber information of the subscriber. In response to having received the message HLR(C) queries its database to find out the current VLR address VLR(C) and other subscriber information of the subscriber. VLR(C) is sent a request PRN (Provide Roaming Number), and VLR responds by allocating a roaming number and sending it to HLR(C) in the acknowledgement message PRNack. HLR(C) receives the message PRNack and sends the roaming number MSRN (Mobile Subscriber Roaming Number) to the GMSC in the acknowledgement message SRIack. According to the invention HLR(C) in addition informs the GMSC about the presence of the BFC flag. This information may be sent, e.g., in the extension field of the message SRIack.

The structure of the SRIack message is shown in Figure 6. The message has normal fields and the extension fields. In the normal fields, the message identifier identifying message and the dialog between the GMSC and the HLR and the MSRN are given using the coding according to the specifications. The extension field is separated from the normal field by a discriminator. The BFC flag is transferred in the extension field. It must be noted that the BFC flag may as well be transferred in the normal fields of the SRIack message if the coding of the flag is specified in the specifications.

AMENDED SHEET

The GMSC now studies based on the value of the call forwarding counter whether the call has been forwarded (stage I3) and whether the BFC flag is present (I4). If the call is forwarded and the BFC flag is present, the call is rejected. In all the other cases the call establishment is continued.

To comply with the preferred embodiment utilizing the predefined set of allowed calling party numbers HLR(C) returns the set to the GMSC in addition to the BFC flag. If the call is forwarded and the BFC flag is present, the calling party number is then compared to the set of allowed numbers. If the calling party number does not belong to the set the call is rejected or, alternatively, forwarded to a prespecified destination. In all the other cases the call establishment is continued.

In another embodiment, the information about the call having been forwarded and the calling party and/or the forwarding party number and preferably also the redirecting reason are sent to the HLR in the extension field of the message SRI. Having received this information the HLR may determine whether the call is to be allowed or rejected, and instructs in the message SRIack the GMSC to do so.

Another implementation of the preferred embodiment of the invention utilizes the intelligent network. Now, if the GMSC determines that the call has been forwarded and the BFC flag is present, an IN query is triggered. In the query, the calling party number is given as a parameter. The IN holds knowledge of the set of allowed numbers. In response to having received the query the IN compares the calling party number to the set of allowed numbers to determine whether the call is to be established or rejected, and instructs the GMSC to do so.

The major advantage of implementing the decision algorithm according to Figure 4 is the presence of the calling party number in the call establishment signaling. Although the specifications enable the transmission of calling party number also in the international signaling this information is not always transferred in the signaling between exchanges in different countries.

The above implementations having the decision algorithm running at the GMSC have the problem of allocating the MSRN in vain because the VLR is not contacted using the allocated MSRN. The MSRN has then to be deallocated after a given delay or by using a special message deallocating the MSRN.

According to yet another embodiment of the invention, set of disallowed forwarding numbers is defined. In this embodiment, the forwarding

AMENDED SHEET

party number is compared to this set, and the call is rejected if the forwarding number belongs to the set of disallowed numbers. In one implementation of this embodiment, the forwarded calls are accepted if the forwarding number is not indicated in the call establishment signaling. In another implementation the forwarded calls are rejected if the forwarding number is not indicated in the call establishment signaling. The problem of this embodiment is, however, that the operators do not always include the forwarding number in the signaling information used in the call establishment procedure.

One of the objectives of the invention is a telecommunication system implementing the above presented method. The functional entities of a telecommunication system according to the present invention are shown in Figure 7. The system has

- storing means 75,77 for storing information on whether the forwarded incoming calls to a subscriber have been determined to be rejected,
- receiving means 72 for receiving a request for establishing a call to the subscriber,
- information retrieving means 74 responsive to the receiving means 72 for
  - determining, based on the request for establishing a call to the subscriber whether the call has been forwarded, and
  - retrieving information on whether the subscriber has defined in his subscriber information that all calls forwarded to him are to be rejected,
- determining means 76 responsive to the information retrieving means and having the functionality of determining whether the call is to be rejected or allowed, and
- continuing means 78 and rejecting means 79 both responsive to the determining means 76.

Preferably, the information retrieving means 74 is arranged to determine whether the call has been forwarded based on the value of the call forwarding counter.

To comply with the preferred embodiment of the invention, some additional arrangements in the functional entities of the system have to be made. These arrangements are the following:

- the storing means 75,77 is arranged to store information about a set of allowed numbers,
- the information retrieving means 74 is further arranged to retrieve the set of allowed numbers from the storing means and the calling party number

AMENDED SHEET

from the request for establishing a call received by the receiving means, and

- the determining means 76 is further arranged to compare the calling party number to the set of allowed numbers, and to determine the call to be allowed if the calling party number belongs to the set.

To comply with another preferred embodiment in the system, in which the forwarding party number is indicated in the signaling for establishing a call, the following arrangements have to be made:

- the storing means 75,77 is further arranged to store information about a set of allowed forwarding numbers,
- the information retrieving means 74 is further arranged to retrieve the set of allowed forwarding numbers from the storing means and the forwarding party number from the signaling for establishing a call received by the receiving means 72, and
- the determining means 76 is further arranged to compare the forwarding party number to the set of allowed forwarding numbers, and to determine the call to be allowed if the forwarding party number belongs to the set.

The entities may be implemented in a single network element or they may be distributed between a plurality of network elements. According to one embodiment, all the functionalities are implemented in the local exchange of a fixed network subscriber. In this embodiment, the all the necessary subscriber information is stored in an internal database of the local exchange.

According to another embodiment, the functionalities are distributed between the local exchange and the intelligent network. Receiving means 72 are implemented in the local exchange. The storing means (75,77) as well as the continuing means 78 and the rejecting means 79 are distributed between the local exchange and the intelligent network.

In mobile telecommunication systems the decision algorithm may be implemented in the MSC currently serving the subscriber. In this embodiment, the storing means are implemented in the VLR connected to the MSC. All the other means are implemented in the MSC.

If the intelligent network IN is used, the storing means is distributed between the VLR (75) and the intelligent network (77). The determining means 76, the continuing means 78 and the rejecting means 79 are as well distributed between the MSC and the IN.

AMENDED SHEET

In another embodiment, the decision algorithm is implemented in the gateway MSC GMSC. In this embodiment, the storing means are implemented in the HLR holding the subscriber information. According to a preferred embodiment the HLR is arranged to send the BFC flag in the extension field of the SRIack message, and the GMSC is arranged to read the flag from said extension field.

If the intelligent network IN is used, the storing means are distributed between the HLR (75) and the intelligent network (77). The determining means are as well distributed between the GMSC and the IN.

In a preferred embodiment the system has in addition configuration means 73 for configuring the subscriber information stored in the storing means 75,77. These means are connected to the storing means. One embodiment of such means is a connection from the network management system of the network operator to the relevant network elements. In this embodiment, the subscriber may change the configuration of his services by calling the network operator and requesting the operator to do the changes.

According to another embodiment, the subscriber is able to change his service configuration himself. The configuration can take place using DTMF dialing, and especially in the mobile telecommunication systems such as the GSM special signaling such as the unstructured supplementary service data USSD signaling between the storing means such as the HLR and the mobile station. Such an implementation is schematically shown in Figure 8. According to the figure, the mobile station MS has an USSD application. This application is arranged to communicate with the USSD application of the home location register HLR. The USSD signaling used to transfer the messages between the applications is routed via the base transceiver station BTS, the base station controller BSC and the MSC. Using the USSD application of his mobile station, the subscriber may configure his subscriber information such as the BFC flag and the set of allowed numbers in the HLR. The information stored in the intelligent network may be configured using a similar signaling method between the mobile station and the SCP of the intelligent network.

In the above exemplary embodiments, the invention is implemented in a system utilizing the ISUP protocol. However, the scope of the invention as defined by the appended claims is not limited to systems utilizing ISUP protocol. The only limitation concerning the signaling protocols is that the protocols used must provide a means for transferring between the network

AMENDED SHEET

elements the necessary information about the forwarded call. It must as well be understood that the order of the steps may vary within the scope of the invention. For example, the value of the counter CFC may be verified before checking the presence of the BFC flag.

AMENDED SHEET

Claims

1. A method of handling calls in a telecommunication system comprising subscribers and network elements such as exchanges, comprising the steps of:

storing in the system subscriber information including information including service definitions of a subscriber;

establishing connections to the subscriber via a network element having access to the subscriber information of the subscriber;

allowing a subscriber to define in his subscriber information that his incoming calls are to be forwarded to another subscriber; and

indicating the forwarding of a call and optionally caller's identity in the call establishment signaling;

characterized in that the method further comprises the steps of:

storing a group of caller identities in the subscriber information for defining a group of allowed caller identities, said allowed caller identities being either those included in or excluded from the group,

determining whether the caller identity of an incoming forwarded call belongs to the allowed identities by comparing the caller identity with said group of caller identities, in response to receiving the call establishment signaling in the network element,

continuing establishing the incoming forwarded call if the caller identity belongs to the allowed identities, and

rejecting the incoming forwarded call if the caller identity does not belong to the allowed identities.

2. A method according to claim 1 in which the subscriber defines himself the group of caller identities.

3. A method according to claim 1 or 2 in a system in which

a call forwarding counter is used in the call establishment signaling,

in response to receiving call establishment signaling requesting establishment of a call from a calling subscriber to a first subscriber and determining that the first subscriber has forwarded his calls to a second subscriber, the call is forwarded to the second subscriber, and the value of the call forwarding counter is incremented,

characterized in that

AMENDED SHEET

to determine whether the call has been forwarded, the value of the call forwarding counter indicated in the call establishment signaling is compared to a predefined value, and if the value of the call forwarding counter exceeds the predefined value, the call is determined to be a forwarded one.

5. A method according to any of the preceding claims, characterized in that the callers, whose calls are to be rejected, are defined by the group of caller identities.

6. A method according to any of the claims 1 to 4, characterized by

defining by the group of caller identities the callers whose calls are to be accepted, and

rejecting the calls whose caller identity does not belong to said group.

7. A method according to any of the preceding claims, characterized by accepting calls from an unknown caller number.

8. A method according to any of the preceding claims in a system comprising further an intelligent network capable of storing subscriber information, characterized in that

in the network element, the event of receiving a forwarded incoming call to a subscriber having determined his forwarded incoming calls to be rejected is defined to be a trigger for sending a query to the intelligent network, and in response to having received the request to establish a call to a subscriber and having determined that the call has been forwarded and the subscriber has determined his forwarded incoming calls to be rejected, a query having the calling party number as a parameter is sent to the intelligent network, and

in the intelligent network, the set of allowed calling numbers in the subscriber information is stored and in response to having received the query sent by the network element, the set of allowed calling numbers is retrieved from the subscriber information, the calling party number is compared to the set, and the network element is instructed to continue the call establishment procedure if the calling party number belongs to the set of allowed calling numbers and to reject the incoming call if the calling number does not belong to the set.

9. A method according to any of the preceding claims in a fixed network comprising a local exchange the subscriber is connected to, characterized in that the network element is a local exchange and the sub-

AMENDED SHEET

scriber information is stored in a database the local exchange is connected to.

10. A method according to any of the claims 1 to 8 in a mobile telecommunication system comprising

a mobile services switching center (MSC) serving the subscriber, and

a visitor location register (VLR) connected to the mobile services switching center (MSC),

characterized in that the subscriber information is stored in the visitor location register (VLR) and the network element is the mobile services switching center (MSC).

11. A method according to any of the claims 1 to 8 in a mobile telecommunication system comprising

a home location register (HLR(C); HLR-C; MHLR) storing the subscriber information of a subscriber, and

a gateway mobile services switching center (GMSC-C) via which the incoming calls of the subscriber are routed,

characterized in that the subscriber information is stored in the home location register (HLR) and the network element is the gateway mobile services switching center (GMSC-C).

12. A method according to any of the claims 1 to 8, characterized in that to determine whether the call has been forwarded, the presence of the forwarding number indicating the identity of the party having forwarded is studied, and if the forwarding number is present, the call is determined to be a forwarded one.

13. A telecommunication system comprising:

exchanges,

subscribers,

means (75,77) for storing subscriber information including information about the service definitions of a subscriber,

means (LE(A),LE(B),LE(C)) for establishing calls to a subscriber via an exchange (GMSC-C) having access to the subscriber information of the subscriber,

means (73) for allowing a subscriber to define in his subscriber information that his incoming calls are to be forwarded to another subscriber, and

AMENDED SHEET

means for indicating (I4) in the call establishment signaling the forwarding of a call, and optionally a caller identity, characterized in that the system further comprises:

storing means (75,77) for storing a group of caller identities in the subscriber information for defining a group of allowed caller identities, said allowed caller identities being either those included in or excluded from the group,

determining means (76) for determining whether the caller identity of an incoming forwarded call belongs to the allowed identities by comparing the caller identity with said group of caller identities, in response to receiving the call establishment signaling in the network element,

continuing means (78) for continuing establishing the incoming forwarded call if the caller identity belongs to the allowed identities, and

rejecting means (79) for rejecting the incoming forwarded call if the caller identity does not belong to the allowed identities.

14. A telecommunication system according to claim 13, characterized in that the determining means (76) is arranged to verify the forwarding of call using a call forwarding counter.

15. A telecommunication system according to claim 13 or 14, characterized in that the system further has configuration means (73) for configuring the subscriber information stored in the storing means (75,77).

16. A network element for a telecommunication system having:

exchanges,

subscribers,

means (75,77) for storing subscriber information including information about the service definitions of a subscriber,

means (LE(A),LE(B),LE(C)) for establishing calls to a subscriber via an exchange (GMSC-C) having access to the subscriber information of the subscriber,

means (73) for allowing a subscriber to define in his subscriber information that his incoming calls are to be forwarded to another subscriber, and

means for indicating (I4) in the call establishment signaling the forwarding of a call, and optionally a caller identity, characterized in that the network element comprises:

AMENDED SHEET

storing means (75,77) for storing a group of caller identities in the subscriber information for defining a group of allowed caller identities, said allowed caller identities being either those included in or excluded from the group,

determining means (76) for determining whether the caller identity of an incoming forwarded call belongs to the allowed identities by comparing the caller identity with said group of caller identities, in response to receiving the call establishment signaling in the network element,

continuing means (78) for continuing establishing the incoming forwarded call if the caller identity belongs to the allowed identities, and

rejecting means (79) for rejecting the incoming forwarded call if the caller identity does not belong to the allowed identities.

17. A network element according to claim 16, characterized in that a call forwarding counter is used for verifying the forwarding of call.

18. A home location register for a mobile telecommunication system comprising:

exchanges,

subscribers,

means (75,77) for storing subscriber information including information about the service definitions of a subscriber,

means (LE(A),LE(B),LE(C)) for establishing calls to a subscriber via an exchange (GMSC-C) having access to the subscriber information of the subscriber,

means (73) for allowing a subscriber to define in his subscriber information that his incoming calls are to be forwarded to another subscriber, and

means for indicating (I4) in the call establishment signaling the forwarding of a call, and optionally a caller identity, characterized in that the home location register comprises:

storing means (75,77) for storing a group of caller identities in the subscriber information for defining a group of allowed caller identities, said allowed caller identities being either those included in or excluded from the group,

determining means (76) for determining whether the caller identity of an incoming forwarded call belongs to the allowed identities by comparing the caller identity with said group of caller identities, in response to receiving the call establishment signaling in the network element,

AMENDED SHEET

continuing means (78) for continuing establishing the incoming forwarded call if the caller identity belongs to the allowed identities, and

rejecting means (79) for rejecting the incoming forwarded call if the caller identity does not belong to the allowed identities.

5

AMENDED SHEET

A
LE(A)
LE(B)
LE(C)
C

FIG. 1

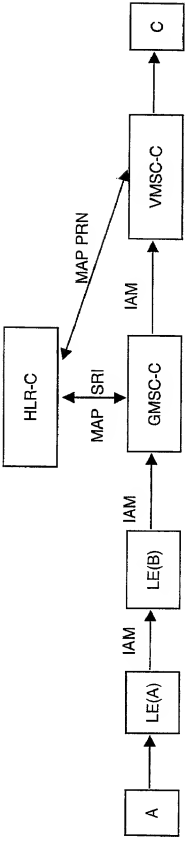
A
LE(A)
LE(B)
GMSC-C
VMSC-C
C
HLR-C
IAM
IAM
IAM
MAP
SRI
MAP PRN

FIG. 2

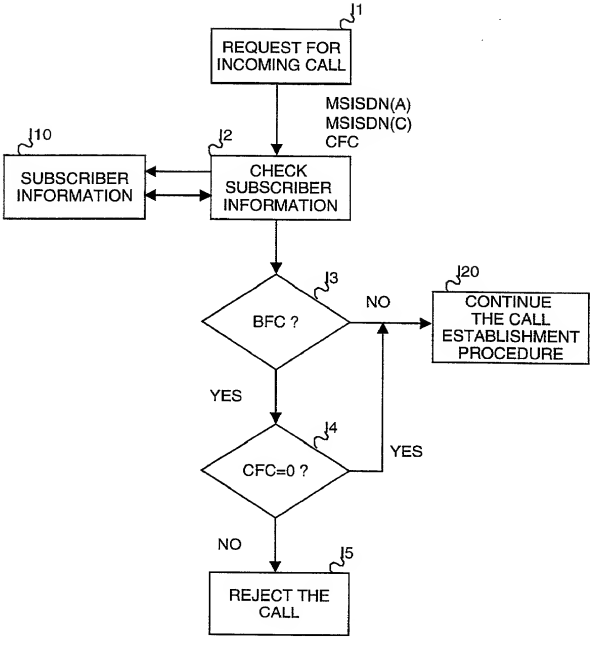
1
REQUEST FOR INCOMING CALL
MSISDN(A)
MSISDN(C)
CFC
10
SUBSCRIBER INFORMATION
2
CHECK SUBSCRIBER INFORMATION
3
BFC ?
NO
20
CONTINUE THE CALL ESTABLISHMENT PROCEDURE
YES
4
CFC=0 ?
YES
NO
5
REJECT THE CALL

FIG. 3

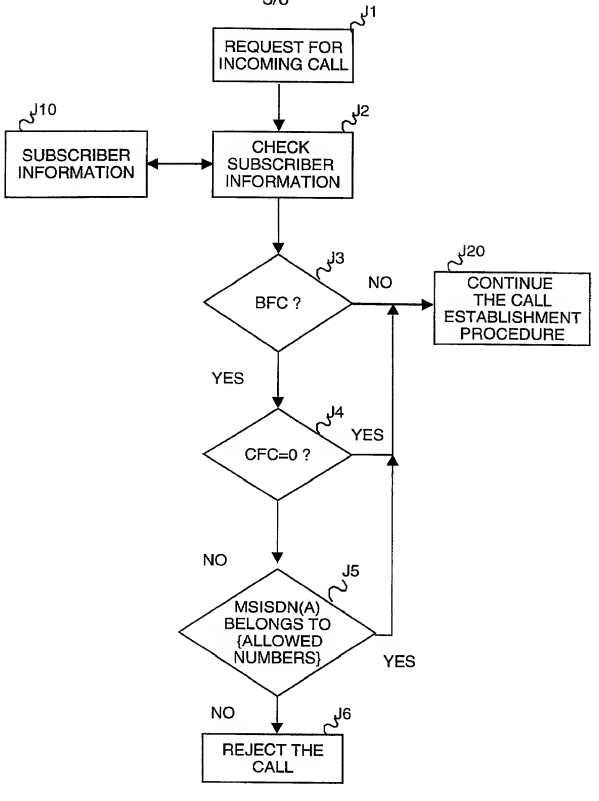
J1
REQUEST FOR INCOMING CALL
J10
SUBSCRIBER INFORMATION
J2
CHECK SUBSCRIBER INFORMATION
J3
BFC ?
NO
J20
CONTINUE THE CALL ESTABLISHMENT PROCEDURE
YES
J4
CFC=0 ?
YES
NO
J5
MSISDN(A) BELONGS TO {ALLOWED NUMBERS}
YES
NO
J6
REJECT THE CALL

FIG. 4

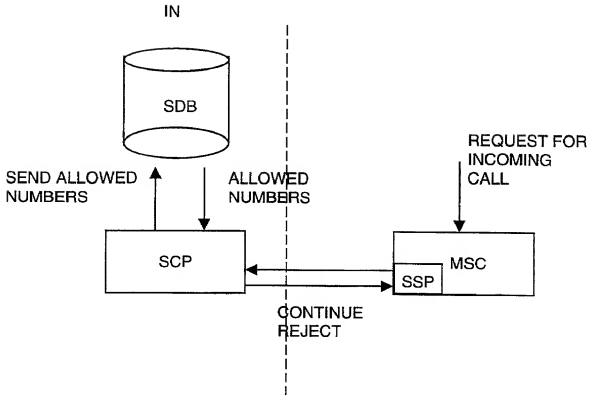
IN
SDB
SEND ALLOWED NUMBERS
ALLOWED NUMBERS
REQUEST FOR INCOMING CALL
SCP
MSC
SSP
CONTINUE
REJECT

FIG. 5

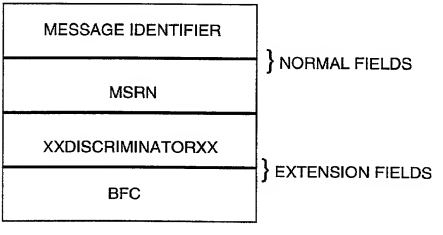
MESSAGE IDENTIFIER
NORMAL FIELDS
MSRN
XXDISCRIMINATORXX
EXTENSION FIELDS
BFC

FIG. 6

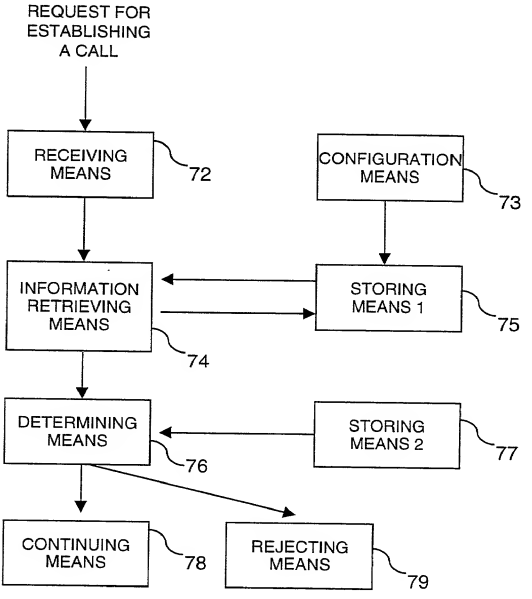

FIG. 7

AMENDED SHEET

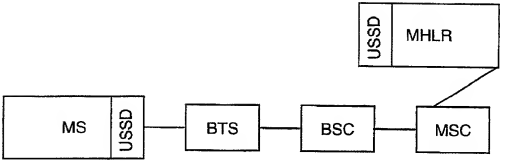

FIG. 8

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

Docket No. 875.0005USU

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor of the subject matter that is claimed and for which a patent is sought on the invention entitled:

HANDLING OF FORWARDED CALLS

the specification of which

(check one) XXX is attached hereto.

____ was filed on _____ as Application Serial No. _____
and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to the examination of this application as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate(s) listed below and have also identified below any foreign application(s) for patent or inventor's certificate(s) having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed
980991 (Number)	Finland (Country)	May 5, 1998 (Day/Mon/Year Filed)	X Yes ___ No
PCT/FI99/00345 (Number)	PCT (Country)	April 28, 1999 (Day/Mon/Year Filed)	X Yes ___ No
(Number)	(Country)	(Day/Mon/Year Filed)	___ Yes ___ No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status - patent, pend., abandon.)
(Application Serial No.)	(Filing Date)	(Status - patent, pend., abandon.)
(Application Serial No.)	(Filing Date)	(Status - patent, pend., abandon.)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

NAMES	REGISTRATION NUMBERS
Paul D. Greeley	31,019
Charles N.J. Ruggiero	28,468
Harry F. Smith	32,493

SEND CORRESPONDENCE TO:	DIRECT TELEPHONE CALLS TO:
Harry F. Smith, Esq. Ohlandt, Greeley, Ruggiero & Perle, L.L.P. One Landmark Square Stamford, Connecticut 06901-2682	Harry F. Smith, Esq. Telephone: (203) 327-4500 Telefax: (203) 327-6401

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

FULL NAME OF INVENTOR	LAST NAME **KANERVA**	FIRST NAME **MIKKO**	MIDDLE NAME
RESIDENCE & CITIZENSHIP	CITY **HELSINKI**	STATE OR COUNTRY **FINLAND** FIN	CITIZENSHIP **FINNISH**
POST OFFICE ADDRESS	P.O. ADDRESS **KAARNATIE 1F 58**	CITY & STATE **HELSINKI, FINLAND**	ZIP CODE **FIN-00410**

Inventor's signature _____ Date 9.10., 2000

MIKKO KANERVA

FULL NAME OF INVENTOR	LAST NAME **HÄMÄLÄINEN**	FIRST NAME **PEKKA**	MIDDLE NAME
RESIDENCE & CITIZENSHIP	CITY **VANTAA**	STATE OR COUNTRY **FINLAND** FIX	CITIZENSHIP **FINNISH**
POST OFFICE ADDRESS	P.O. ADDRESS **KNAAPINKUJA 5 D 29**	CITY & STATE **VANTAA, FINLAND**	ZIP CODE **FIN-01760**

Inventor's signature _____ Date 20.10, 2000

PEKKA HÄMÄLÄINEN

FULL NAME OF INVENTOR	LAST NAME **HUOTARI**	FIRST NAME **SEPPO**	MIDDLE NAME
RESIDENCE & CITIZENSHIP	CITY **ESPOO**	STATE OR COUNTRY **FINLAND** FIX	CITIZENSHIP **FINNISH**
POST OFFICE ADDRESS	P.O. ADDRESS **ALBERGAN ESPLANADI 4 B 31**	CITY & STATE **ESPOO, FINLAND**	ZIP CODE **FIN-02600**

Inventor's signature _____ Date 2.10.2000, 2000

SEPPO HUOTARI

FULL NAME OF INVENTOR	LAST NAME **YLI-JUUTI**	FIRST NAME **ERKKI**	MIDDLE NAME
RESIDENCE & CITIZENSHIP	CITY **HELSINKI**	STATE OR COUNTRY **FINLAND** FIX	CITIZENSHIP **FINNISH**
POST OFFICE ADDRESS	P.O. ADDRESS **RUNEBERGINKATU 65 A 11**	CITY & STATE **HELSINKI, FINLAND**	ZIP CODE **FIN-00260**

Inventor's signature _____ Date 5.10.2000, 2000

ERKKI YLI-JUUTI